I hereby certify that this paper is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450
(Total Pages for Affidavit/Declaration): 8 pages)

Francis T. Coppa F. T. Coppa June 22, 2009
(Signature) (Date of Deposit)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Liang Jiang et al — Group Art Unit: 1793

Application No. 10/675,367 — Examiner: Roe, Jesse R.

Filed: September 30, 2003 — Confirmation No.: 5979

For: NICKEL-CONTAINING ALLOYS, METHOD OF MANUFACTURE THEREOF AND ARTICLES DERIVED THEREFROM

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTARY AFFIDAVIT UNDER 37 CFR 1.132 – June 2009

We are Ganjiang Feng and Liang Jiang, and we declare as follows:

1) I, Ganjiang Feng, am a co-inventor of the subject matter claimed in the above-referenced patent application. I received a PhD degree in Materials Science from the Rutgers University in New Brunswick, New Jersey. I have been employed as a Technical Leader by General Electric Company since 1998. During that time, I have worked on a wide variety of projects directed to the preparation and casting of high-temperature alloys, including those made from nickel- and cobalt-based materials, as well as nickel-based superalloys.

2) I, Liang Jiang, am a co-inventor of the subject matter claimed in the above-referenced patent application. I received a PhD degree in Metallurgical Engineering from the University of Tennessee, in Knoxville, Tennessee. I have been employed as a senior metallurgist by General Electric Company since 2001. During that time, I have also worked on a wide variety of projects directed to the preparation and casting of high-temperature alloys, including those made from nickel- and cobalt-based materials, as well as nickel-based superalloys.

3) We are both aware that claims 1, 2, 4, 6, 8, 19 and 22-23 of the referenced Application have been rejected under 35 U.S.C. 103(a), in view of the teachings of Hamada (JP 11-217644); and that claim 10 has been rejected under the same section of the statute, in view of Hamada and Twigg et al (U.S. Patent 3,723,108). Moreover, we are aware of the fact that claims 1, 2, 4, 6, 8, 10, 19 and 22-23 have been rejected under 35 U.S.C. 103(a), in view of the Wheaton patent (U.S. 3,561,955).

4) As described in the patent application, and during previous prosecution of the application, one key goal of ours was to provide an alternative to cobalt-based alloys. While the cobalt alloys exhibit strong advantages for certain applications, their susceptibility to material "creep" and thermal fatigue cracking make them much less suitable for some of the uses described in our patent application. As noted in prosecution, the search for a good substitute for the cobalt alloys was a serious challenge for us, since the substitute material had to possess a particular combination of strength, corrosion resistance, weldability, and creep resistance. Moreover, the new alloy compositions needed to be economically viable, and within certain weight guidelines.

5) The nickel alloys we discovered – discussed at length during prosecution - contain at least aluminum, titanium, niobium, and chromium, according to certain, specific guidelines and ranges. As also described previously, our compositions are based on three distinctive requirements: (1) They require the presence of selected amounts of a core "sub-group" of elements – aluminum, titanium, and niobium; (2) The atomic ratio of

aluminum to titanium must be within the range of 0.5 to about 1.5, in preferred embodiments; and (3) In many preferred embodiments, the compositions must be substantially free of tantalum.

6) We have reviewed the cited art, with particular emphasis on the Hamada reference. This review was prompted by the elemental comparison of Hamada with the present claims, on page 3 of the Office Action of August 5, 2008. In regard to that Office Action, and the Action of April 22, 2009, we respectfully disagree with some of the Patent Office views, in regard to obviousness. In brief, Hamada describes alloy compositions which are used as combustor liners for gas turbines. The alloys appear to be based on chromium, cobalt, molybdenum, tungsten, aluminum, titanium, tantalum, niobium, hafnium, and carbon, in addition to nickel.

7) However, Hamada never suggests the particular compositions of our present invention, nor a reason for selecting such constituents and ranges. The broad teachings of Hamada surely include some overlap with our claimed compositions, but the remainder of the scope covered in the reference is directed to compositions which are clearly outside of our objectives and formulations.

8) With specific reference to the chart presented by the Examiner in the August 5 Action (attached hereto, for convenience), we note a number of compositional regions which demonstrate that Hamada has no recognition of our specific inventive concepts.

First, Hamada allows for 0% titanium. For our preferred compositions, the absence of titanium will probably result in lower APB (anti-phase boundary) energy and strength within the gamma-prime (γ') phase, which in turn, will result in inferior high-temperature properties, such as tensile strength and creep strength.

Second, Hamada's allowance of only negligible amounts of aluminum (e.g., 0.01 wt %) would prevent formation of the required

amount of gamma-prime phase in our alloy compositions, as emphasized in our patent specification.

Third, Hamada's allowance of tantalum demonstrates a lack of recognition that the specific elimination of tantalum in some alloy compositions can lead to greatly-increased creep strength, as in the case of some of the preferred alloy compositions which we discovered.

Fourth, Hamada contains no suggestion that specific aluminum-titanium ratios are required, and includes alloy compositions which are both within and outside the scope of this key parameter. The reference also contains no suggestion regarding the effect of having a certain ratio of aluminum-titanium, as we have emphasized in our case.

9) We compared alloy samples within the scope of our invention, with samples falling outside the scope of our invention, but within the scope of the Hamada reference. (Some of the samples were commercially-available materials). The samples were prepared by combining the listed components (Table I) in the melt, at temperatures in the range of about 2700°F (1482°C) to 2800°F (1538°C). The molten alloys were then cast in a suitable ceramic mold, by a conventional investment casting technique.

With reference to Table 1, below, compositions for Sample A and Sample B are provided, in weight percentages:

Table 1

Sample (wt %)	Ni	Co	Cr	Mo	W	Al	Ti	Nb	Ta	Hf	C	Fe	TOTAL
A	50.00	20	20	5.8	0	0.5	2.2	0	0	0	0.1	0.7	99.26
B	60.00	10	22.5	0.2	2	1.7	2.3	1.4	0	0	0.1	0	100.09

Sample A was outside the scope of the present invention, but inside the scope of Hamada. The atomic ratio of aluminum to titanium in the sample was 0.4

Sample B was within the scope of the present invention. The atomic ratio of aluminum to titanium in the sample was 1.3.

Moreover, Sample A had substantial amounts of the "eta" phase after thermal exposure at elevated temperatures, which is undesirable for our invention. Sample B was substantially free of the eta phase, in the as-cast condition, and after thermal exposure at elevated temperatures. (Sample A also had an insufficient level of the gamma prime γ' phase, based on requirements for our alloy compositions).

Test coupons were machined from cast and heat-treated alloys via wire EDM (Electrical Discharge Machining), and grinding-machining. The coupons had dimensions of approximately 5 inches (12.7 cm) in length, and 0.75 inch (1.9 cm) in diameter.

The coupons were tested for creep resistance properties, according to the ASTM creep-testing standard, E139.

Figure 1, attached, is a graph depicting time-to-1% creep strain, at 1600°F (871°F) temperature, and at the same stress level. As shown in the figure, Sample B exhibited a tremendous increase in creep resistance, as compared to Sample A. The estimated time-to-1% creep strain level for Sample A was 110 hours, as compared to 3050 hours for Sample B. (Sample B was also superior in creep resistance to other nickel-based commercial alloys, e.g., those containing insufficient levels of aluminum).

These results were also surprising for another reason. A review of the respective compositions shows that the level (total) of the precipitation-strengthening elements, aluminum, titanium, and niobium, increased by 89%, for Sample B, as compared to Sample A, yet the increase in creep resistance was about 2800%.

Each of us hereby declare that all statements made herein of our own knowledge are true, and that all statements made on information and belief are believed to be true, and further, that willfully false statements and the

like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and that all such willfully false statements may jeopardize the validity of the present Application or any patent issued thereon.

BY: Liang Jiang

NAME: Liang Jiang

TITLE: Senior Metallurgist

DATE: 6-19-2009

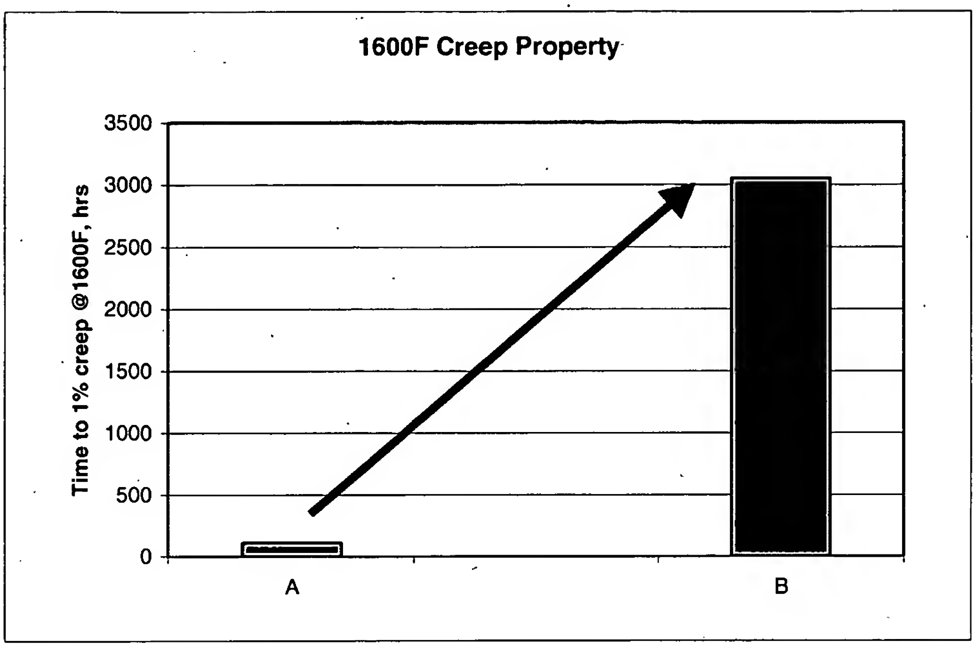
BY: Ganjiang Feng

NAME: Ganjiang Feng

TITLE: Technical Leader

DATE: 6-22-2009

Figure 1 of Affidavit



(From Office Action of August 5, 2008; Page 3)

Element	From Instant Claims (weight percent)	Hamada (JP '644) (weight percent)	Overlap (weight percent)
Al	about 1.5 – about 4.5	0.01 – 3.0	about 1.5 – 3.0
Ti	about 1.5 – about 4.5	0 – 2.0	about 1.5 – 2.0
Nb	about 0.8 – about 3	0 – 2.0	about 0.8 – 2.0
Cr	about 14 – about 28	18 – 25	18 – 25
Zr	up to about 0.2	0	0
Co	about 10 – about 23	17 – 23	17 – 23
W	about 1 – about 3	0 – 10	about 1 – about 3
Ni	about 40 – about 70	35 – 64.99	about 40 – 64.99